The ‘Tweeting Book’ and the question of ‘non-human data’

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Abstract

This short paper describes an experimental radio-frequency identification (RFID) system designed to playfully explore the possibilities of object agency, in the form of 'tweeting books'. The use of web-enabled sensors is discussed in the context of the emerging field of Learning Analytics. The analysis of the 'tweeting books' prototype challenges the idea of straightforward 'non-human' data and the isolation of specific and localised agency. I will draw upon sociomaterial theory, which encompasses a broad reconsideration of the divisions between culture and nature, the human and the non-human. As such, the production of data can be thought of as the entanglement of human user and non-human technology, rather than the privileging of human intention as the exclusive source of agency. This will be suggested to have important implications for Learning Analytics, which is often premised on a commitment to the idea that data directly represents human behaviour.

Introduction

The field of Learning Analytics (LA) appears to have gained significant traction in recent years (Brown 2012), often promising to revolutionise education by exposing ever-increasing amounts of data from student activity in online courses (Long & Siemens 2011, Siemens 2013). As Siemens suggests, 'for researchers, learning sciences, and education in general, data trails offer an opportunity to explore learning from new and multiple angles' (2013, p2). The 'data trail' is therefore key to the idea of LA; a stream of data deriving from the conduct of individual students participating in some kind of digitally-mediated educational activity.

However, I suggest in this paper that LA is constrained by two significant tendencies in the ways data are collected. Firstly, the reliance on digital spaces, such as Virtual Learning Environments (VLEs) or Massive Open Online Courses (MOOCs), to generate data limits the view of education to that taking place online. As Long and Siemens state:

> 'Listening to a classroom lecture or reading a book leaves limited trails. A hallway conversation essentially vaporizes as soon as it is concluded. However, every click, every Tweet or Facebook status update, every social interaction, and every page read online can leave a digital footprint' (Long & Siemens 2011, p32).

This discussion is therefore motivated by a concern for activities that happen outside of digital spaces and social media. What if reading a book could leave a trace? Secondly, and most significantly, the quote above also reveals the anthropocentric view of education

which underpins the field of LA, and which I suggest limits the creative potentials of data capture, evaluation and visualisation. Such a statement may seem somewhat peculiar, given that, as common sense tells us, education is an entirely human endeavour. Where else could it possibly take place? However, it is precisely this assumption that I want to challenge in this paper; that human beings are distinct and independent from the world around them, and that in order to understand education we need only track, measure, and analyse, individual learners, societies or cultures. To focus exclusively on human beings appears to marginalise and subordinate the role that technologies, objects, and spaces might play in educational settings infused with non-human influences.

With these proposed limitations in mind, this paper seeks to explore the possibility of capturing 'non-human' data with the use of web-enabled sensors. Sensors are devices which respond to a physical input, such as movement or location, and convert this quantity into some kind of signal that can be stored as data. The broader field of so-called 'big data' has considered the use of sensors, suggesting, for example, that the increasing use of mobile technologies and devices are involved in producing 'roaring streams of personal data' (Bollier 2010, p3). A substantial body of work has explored the implications of pervasive sensor data in social life (for example Dodge & Kitchin 2005), and urban planning (for example Crang & Graham 2007), yet such studies are much less common in educational research. Work in LA has acknowledged the potential of sensors, Siemens suggesting:

> 'With the prominence of mobile devices and emergence of wearable computing, such as Google Glass, and the "quantified self" movement, the scope and quantity of data available for analytics will continue to increase' (Siemens 2013, p9)

However, such amplified and intensified data collection is grounded in a continued concern for measuring the individual or social behaviour of human beings (Long & Siemens 2011, Siemens 2013). In contrast, this paper seeks to explore what might be 'non-human' in these data collection strategies; the software, algorithms and codes that might be acting independently of the researcher and the researched.

This paper will describe just one prototype sensor system: the 'tweeting book'. This experiment was created as a way of critically engaging with a method of non-human data capture. Rather than assuming this system to be straightforward, the subsequent analysis will explore the extent to which this prototype can be considered to capture 'non-human' data, as well as whether it can be deemed a 'method' of research at all.

Tweeting books

This experimental 'method' made use of RFID sensor technology to 'give voice' to books by allowing them to contribute to the social media service Twitter. In other words, and in a playful sense, this system allows 'books to send a tweet'. The development of this tentative method was motivated by the question of how object agency might be incorporated into a research strategy.

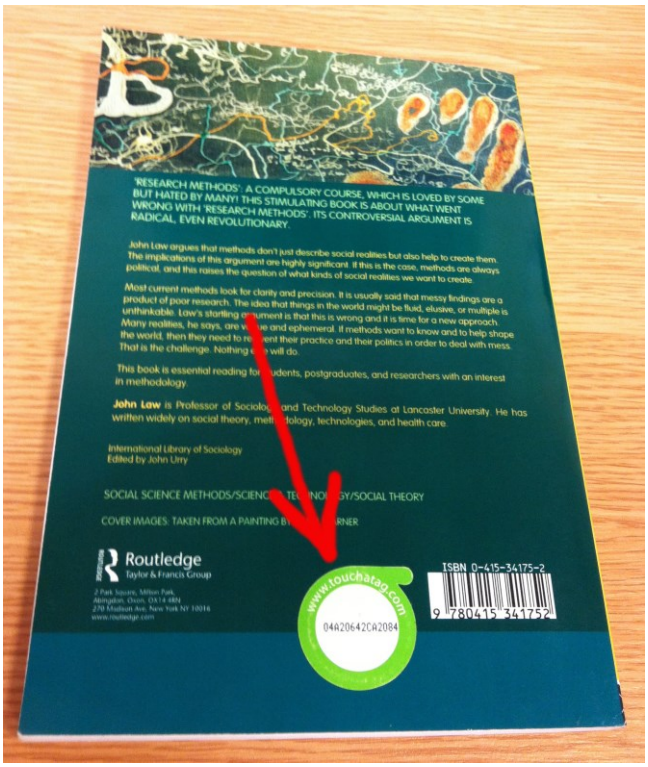

Figure 1: The back cover of a book affixed with an RFID tag

The system made use of RFID tags attached to the back cover of a number of specific books identified for this project (see fig 1). A corresponding RFID sensor was attached to a book stand, positioned in such a way that placing the books on the stand would allow the tags to come into contact with the sensor (see fig 2). This sensor technology was programmed to send a tweet when a particular tag came into contact with the sensor, thus indicating that a specific book had been placed on the book stand. The acknowledged inference here is that by placing the book on the stand, it is being 'read'. The tweets sent corresponded to the book in question, and contained a short sentence copied from the text (see fig 3). The system used 'Touchatag'[1] sensor hardware which was reprogrammed using the Processing library for Touchatag[2]. As such, this system was designed with the idea of allowing a book to 'tweet its

[1] The 'Touchatag' organisation announced a shutdown in 2012, however they previously developed both RFID hardware and an online service allowing the use of simple applications http://en.wikipedia.org/wiki/Touchatag

[2] see http://forum.processing.org/one/topic/new-library-touchatag-rfid-readers-on-processing.html

own content', and thus exhibit some kind of agency in whatever educational situation it might be involved in. Contribution of this 'object' was limited to Twitter, however further development could broaden the range of digital spaces in which it could play a role.

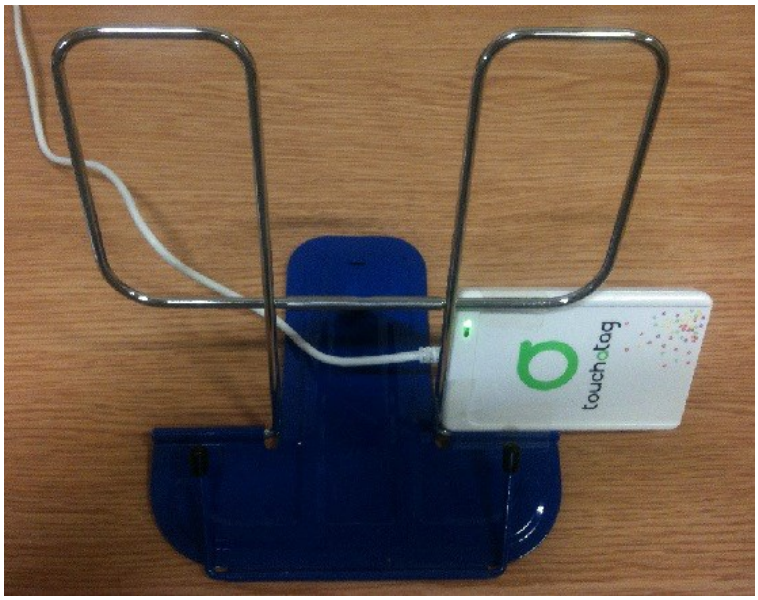

Figure 2: A book stand with a 'Touchatag' RFID sensor attached to the bottom right section.

Figure 3: Example tweets sent from the 'tweeting books' prototype to a test '@MOOC_space' Twitter account.

While such a prototype system is not currently used as part of any formal educational provision, I suggest that 'tweeting books' may indicate a potentially productive use of web-

enabled sensors in education. Overlooking the content of the tweet for a moment, such a system indicates the location and time that a book is being used, perhaps providing valuable contextual information about how the resources of a particular course are being used by students. This might feed into a strategy of broadening the scope of data collection in LA to incorporate activities and situations that take place outside of formal online spaces. While created specifically for books – perhaps a rather obvious 'educational object' – such a system might be employed to facilitate the positional tracking of a range of items used in an educational context. The data derived from such systems might contribute to increased information about where and when objects are used for specific tasks, amplifying the pool of data from which one might engage in an the analysis of learning.

Nevertheless, I suggest that the 'tweeting book' can be interpreted as surfacing more profound questions about data collection: what does it mean to capture data *about* education; data assumed to *represent* real activities, people, phenomena, or things? I propose that a more thorough analysis of the 'tweeting book' might encourage a way of thinking that challenges assumptions in this area, and points towards alternative frameworks for understanding the practices of data collection in education.

Representing the non-human?

The first question to ask here is: can we so straightforwardly collect 'non-human data' by measuring the ways that objects autonomously act in education? Educational research is demonstrating a growing interest in the agency or autonomous materiality of the non-human (for example Sorensen 2009, Fenwick & Edwards 2010, Fenwick *et al.* 2011) or the role of

'artifacts' in online courses (Ponti 2014), suggesting that such a data collection strategy might be appropriate. However, there are two assumptions in the proposed question. Firstly, that the 'non-human' can be isolated and identified (Mutch 2013), a position which would appear to maintain a distinction between the human and non-human world. This stance might then preserve the privileging of human concerns identified previously in LA, where the objects and spaces of education can be quantified merely as background influences. The second assumption concerns the role of research method in *representing* the object of study. While a representational ontology is not only engrained in established research methodology (Fenwick & Edwards 2013), it is also fundamental to the LA approach, in which data is produced as a reflection of 'real' behaviour. As such, inferences made upon the data can be assumed to be appropriate for the 'actual' educational activity they are designed to represent.

So, does the 'tweeting book' constitute the isolation of 'non-human' data, such that the books can be considered to display agency or autonomy? No. Perhaps the most obvious counter here would be the requirement for a human being to physically place the book on the bookstand for the tweet to be sent. However, importantly, can we then say that it is a human being that straightforwardly creates the tweet? In order for the message to be produced, a human user has to have placed a book in a specific location, subsequent to a human programmer having written the correct lines of code, but also preceding an algorithm that randomly selects the text from a pool of options. Thus, a number of contingent relations between material objects, (at least two) humans and code need to converge for the successful production of a tweet. The random selection of text means that the person placing the book on the stand has no control over the precise textual content of the tweet. A more productive approach, I suggest, would therefore be to consider the 'tweeting books' as an entanglement of humans and non-humans (Fenwick *et al.* 2011); in this case, users, programmers,

algorithms and code. It is through such a reading that the most profound implications of the 'tweeting book' are surfaced. Rather than being a system which allows an object to 'act', this method questions the very isolation of agency itself, as a specific and bounded locus of intention.

Concluding remarks

This short paper has described an experimental prototype RFID system that allows books to send tweets. As such, it may serve as a noteworthy example of the use of web-enabled sensors in education. Sensors might be considered to broaden the scope of data collection in the emerging field of Learning Analytics, which is often limited to measurements of the online activity of students.

However, through the playful suggestion of object agency, the experimental 'method' of the 'tweeting book' has highlighted the difficulty of identifying the division between humans and non-humans in the production of data. I contend that it is precisely this conclusion that has significant implications for the field of Learning Analytics. To conclude that data simply and transparently represent the behaviours of students, assumes human beings to be the exclusive source of intention and agency. The analysis of the 'tweeting book' experiment highlights an alternative perspective, one in which we can view the production of data as an entangled, contingent and relational process involving both intentional humans and active algorithms. This conclusion does not challenge the representationalism of data; data is by its very definition a point of quantification that signifies and corresponds to whatever has been measured. Rather, the significance lies in what such data is assumed to represent. In educational environments that are increasingly pervaded by complex algorithms, can we continue to assume that data straightforwardly

corresponds to the behaviour of a nostalgic humanist subject, cast as the exclusive source of agency? I contend that a more productive way forward is to de-centre the human being in education, and begin to acknowledge that educational data is representative of distributed agencies, and the sociomaterial entanglement of humans and non-humans.

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